

University of Groningen

Convergence of pass-through from money market to lending rates in EMU countries

Toolsema-Veldman, Linda; Sturm, J.E.; de Haan, J.

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:
2002

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Toolsema-Veldman, L., Sturm, J. E., & de Haan, J. (2002). Convergence of pass-through from money market to lending rates in EMU countries: New evidence. Groningen: University of Groningen.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Convergence of pass-through from money market to lending rates in EMU countries: New evidence

Linda A. Toolsema

University of Groningen, The Netherlands

Jan-Egbert Sturm

University of Munich and ifo Institute for Economic Research, Munich, Germany

Jakob de Haan^{*†}

University of Groningen, The Netherlands and CESifo, Munich, Germany

This version, February 2002

Abstract

This paper examines whether the pass-through of monetary policy measures in 6 EMU countries has become more similar over time. The countries included are: Belgium, France, Germany, Italy, the Netherlands and Spain, and the sample period is 1980-2000. We conclude that major differences in pass-through exist in our sample, notably for the initial response to policy-induced interest rate changes. However, there is some (weak) evidence for convergence of monetary policy transmission.

Keywords: monetary transmission, pass-through, interest rate stickiness, EMU.

JEL classification: E52, E43.

^{*}Corresponding author: Jakob de Haan, De-part-m-ent of Economics, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands; email: j.de.haan@eco.rug.nl; tel. 31-50-3633706; fax 31-50-3633720.

[†]This is a substantially revised version of Toolsema et al. (2001). We like to thank participants of the CCSO/SOM seminar, the conference on The European Macro-economy: Integration, Employment, and Policy Co-ordination, 9th and 10th November 2001, University of Antwerp, Faculty of Applied Economics, Antwerp, Belgium and the CESifo area conference on Macro, Money and International Finance, Munich, 8-9 February 2002 for their comments and Bert Schoonbeek and Ton Steerneman for their help. Part of this research was done while De Haan was visiting researcher at De Nederlandsche Bank. Only the views of the authors are expressed.

1 Introduction

On January 1st, 1999 Europe entered a new era with the adoption of a single currency - the euro - by 11 of the European Union's 15 member states. For the first time since the Roman Empire, a large portion of Europe again shares a common currency.¹ The launch of the euro has created the world's second largest single currency area in terms of economic size after the United States (Eijffinger and De Haan, 2000).

With the start of the Economic and Monetary Union (EMU), participating countries no longer have their own monetary policy. The European Central Bank (ECB) is responsible for monetary policy decisions in the euro zone. The move toward EMU has been accompanied by extensive discussions about asymmetries in monetary transmission across the euro zone countries. Most of the evidence is based on Vector Auto Regressions (VARs). The conclusions of the various studies differ markedly. Whereas, for instance, Barran et al. (1996) only find small differences, Rawasmany and Sloek (1997) and Ehrmann (2000) report substantial differences in the impact of monetary policy measures across countries in the euro area.

Amongst other things, the impact of monetary policy on the real economy depends on how changes in policy rates are transmitted to market interest rates. Two elements are crucial for the transmission of monetary policy decisions: the speed and the degree to which changes in the policy rate affect the cost of borrowing. A well-known study by Cottarelli and Kourelis (1994) on the pass through of monetary policy measures concludes that the degree of stickiness of market rates is, on average, quite high and shows considerable variation, especially in the short run, also in the countries in the euro area.

The purpose of this paper is to examine how the pass through of monetary policy measures in the six largest EMU countries (Belgium, Germany, Spain, France, Italy, and The Netherlands) has evolved over time. The countries in our sample cover most of the euro zone. We want to answer the question whether or not the pass through has become more similar in these countries, i.e. whether there is convergence in monetary transmission. This is an important issue. Some of the critics of EMU have argued that asymmetries in monetary transmission across the countries in the euro area may seriously

¹At the time of writing, three EU member states do not (yet) participate in EMU: Denmark, the United Kingdom and Sweden (Greece participates in EMU since 2001). Still, it is expected that at some time these countries will also use the euro, as will some potential future EU member countries in Central and Eastern Europe.

hamper the common monetary policy of the ECB (see e.g. Dornbusch et al., 1998).

Most previous studies have focused on differences in pass through across countries at a certain point in time. In contrast, we focus on the question of whether differences in pass through across countries, if any, have increased or decreased over time. Our estimation period is 1980-2000. For our purpose, we first estimate the long-run relationship between money market and lending rates using the FM-OLS estimator and test for parameter instability following Hansen (1992). As these tests indicate that certain changes have occurred over time, we then apply an Error Correction Model (ECM) with a moving window in which the number of observations remains the same. For each regression one observation at the beginning of the window is dropped and one is added at the end of the window.

We conclude that differences in pass through exist in our sample, both in terms of initial as well as long-run responses to policy-induced interest rate changes. However, there is some (weak) evidence for convergence of monetary policy transmission.

The remainder of the paper is organized as follows. Section 2 offers a brief review of the literature. Section 3 presents our model and the data used, while section 4 contains our estimation results. The final section offers some concluding comments.

2 Review of the literature

The theoretical and empirical literature on the pass through of monetary policy measures has focused on three issues: 1. the theoretical explanation of interest rate stickiness; 2. the degree of interest rate stickiness across countries; and 3. the relationship between interest rate stickiness and financial structure. In this section we briefly review the relevant literature.

2.1 Interest rate stickiness: Theory

Lowe and Rohling (1992) point out that many of the explanations advanced to explain price stickiness in goods markets are also applicable to financial markets. Following their approach, we may distinguish four theories: agency costs (Stiglitz and Weiss, 1981), adjustment costs (Cottarelli and Kourelis, 1994), switching costs (Klemperer, 1987), and risk sharing (Fried and Howitt, 1980).

Agency costs arise due to asymmetric information. Banks cannot distinguish between risky and less risky projects. Consequently, an increase in the costs of funding will not necessarily result in a proportionate increase in the loan rate of banks. When the bank increases its loan rate, the firms with the safest projects will be the first to withdraw from the market. As a result, the mix of applicants applying for loans changes adversely (adverse selection). Furthermore, firms may decide to undertake riskier projects due to the higher interest rates (moral hazard). As the probability of default would rise due to the higher interest rate, an increase in the loan rate will not necessarily result in a proportionate increase in the bank's expected receipts. Banks may therefore prefer to set the loan rate below the market clearing rate and ration credit.

Cottarelli and Kourelis (1994) argue that the banking industry faces *adjustment costs* when interest rates change. A profit-maximizing bank will only change the lending rate if the adjustment costs are lower than the costs of keeping lending rates unchanged. The cost of maintaining non-equilibrium rates is positively related to the elasticity of the demand for bank loans. The demand for bank loans is less elastic in markets that have fewer competitors, higher barriers to entry or no alternative sources of finance, including foreign capital. Finally, banks may not adjust their lending rates if they perceive that the changes in the money market rates are only temporary.

Banks are concerned with the characteristics of their clients, like risk profile. Unlike many other markets, in banking one client is not as good as the other. To find out about the characteristics of clients is a costly activity for a bank which is often passed on to the client in the form of a fee, which makes it costly for a buyer to switch from one bank to another (*switching costs*). As shown by Klemperer (1987) switching costs cause the derivative of price with respect to marginal cost to be less than one (Lowe and Rohling, 1992).

Finally, *risk sharing* may explain interest rate stickiness. Fried and Howitt (1980) argue that borrowers may be more risk averse than the shareholders of a bank. As the borrower is risk averse, he prefers stable interest rate payments. The bank therefore charges a less variable interest rate than its marginal cost of funds for which it is compensated by a higher interest rate (risk premium).

	Belgium	Germany	Spain	France	Italy	Netherlands
Cottarelli and	21	37	36	-	12	52
Kourelis (1994)	87	100	94	-	83	82
Borio and	61	11	0	43	26	108
Fritz (1995)	127	105	117	74	122	108
BIS (1994)	85	18	-	43	14	125
Mojon (2000)	96	68	65	86	50	99

Table 1: Short-run and long-run effect of policy rate increase of 100 basis-points on lending rate (basispoints).

2.2 Interest rate stickiness across countries: Empirical evidence for EMU countries

Various studies have investigated the pass through empirically in a multi-country setting.² Cottarelli and Kourelis (1994) report important differences in pass through in EMU countries. Table 1 shows their estimates of the short-term (initial) and long-term effect for the six countries which are focused upon in the present study. Also the outcomes of similar studies by Borio and Fritz (1995), BIS (1994) and Mojon (2000) are presented in this table. Note that the first row shows the short-run effect and the second presents the long-run effect. The BIS (1994) and Mojon (2000) studies only report short-run multipliers. The short-run effect refers to impact multipliers for Cottarelli and Kourelis (1994) and BIS (1994); to one-month multipliers for Borio and Fritz (1995); and to three-month multipliers for Mojon (2000). For the latter, we report the multipliers that refer to short-term loan rates.

Mojon (2000) examined the pass through in the same six EMU countries as the present paper for the period 1979-1998 for a whole range of deposit and credit rates (which can, however, not be fully compared across countries) and confirms the conclusion of heterogeneity of previous studies. Finally, Sander and Kleimeier (2001) provide evidence that the speed of adjustment and the nature of the adjustment process itself differ in the EMU countries.

Some of the empirical studies go in a similar direction as the present paper

²Moazzami (1999) compares lending rate stickiness in Canada and the US. He concludes that the long-run multipliers in Canada and the US are not significantly smaller than unity, suggesting that lending rates adjust fully to changes in the money market rates. However, the impact effects are larger in Canada than for the US. Some studies report evidence on interest rate stickiness for just one country. For instance, Lowe and Rohling (1992) find large differences in pass-through in Australia across different types of loans. Cottarelli et al. (1995) report evidence on interest rate stickiness for Italy.

in the sense that they examine short- and long-run multipliers for different subsample periods. For instance, Mojon (2000) analyses the pass through for different interest rate cycles and finds that the dispersion of countries around the average pass through slightly decreases from the 1979-1988 cycle to the 1988-1998 cycle. However, in spite of this evolution, Mojon (2000) concludes that responses of retail bank rates to changes in the money market rate remain heterogeneous across the countries of the euro area.

Recently, Hofmann (2002) has examined the pass through in France, Germany, Italy and Spain over the period 1984-1998 using the Johansen cointegration analysis. He concludes that an innovation to the money market rate is fully passed through to short-term and long-term business loan rates in the long run. In the short run the response of lending rates is rather sluggish. From the perspective of the present paper, it is interesting that Hofmann also finds that the significance of differences in pass through across the countries vanishes within twelve months after the money market rate innovation.

2.3 Pass through and financial system

Although the EMU countries now share the same currency, their financial systems show considerable differences. As pointed out by Mojon (2000), national segmentation in the retail banking industry may remain significant in spite of EMU as retail banking involves heavy investments in brand names, in a network of branches and in relationships with customers. Also differences in regulation may cause retail banking markets to remain segmented along national lines. Furthermore, differences in the balance sheet structure of households and firms will only gradually adjust to the new monetary regime. As a consequence, the pass through from policy-controlled interest rates to bank interest rates may remain country specific. This potential source of asymmetry in monetary transmission is particularly relevant in the euro area where bank rates are a key determinant of the cost of capital and the yield on savings.

Various studies have examined the link between differences in pass through and diverging financial structures. Cottarelli and Kourelis (1994) obtain a significant negative effect of five financial structure variables on the pass through: the absence of a money market for negotiable short-term instruments, the volatility of the money market rate, constraints on international capital movements, the existence of barriers to entry and the public ownership of the banking system.

Following Cottarelli and Kourelis (1994), Mojon (2000) has estimated the impact of financial structure on the pass through within a panel of 25 credit market rates and 17 deposit rates in the six biggest EMU countries. He finds that for both credit and deposit rates the volatility of the money market rate reduces the pass through and that competition from direct finance increases it.

Cottarelli et al. (1995) conclude that differences in the degree of lending rate stickiness among Italian banks are to a large extent due to differences in concentration of the local markets in which banks operate. Other relevant factors are: the extent of securitization of banks' liabilities, the form of the loan, bank size and the banks' ownership structure.

3 Data and methodology

An important difficulty in research like this, is to find interest rates that are comparable across countries. The money market rate used refers to the three-month interbank rate in the various countries. As the study of the BIS (1994) shows that the response of the three months money market rate to the official monetary policy rate is nearly one for one, we use this interest rate as proxy for the policy-determined interest rate (see also Sander and Kleimeier, 2001).³ For the observations after the start of EMU the three month euro interbank market rate has been used.⁴ The data for the lending rate (short-term loans to enterprises) have been provided by the ECB, except for Italy where we have used the lending rate as published in the International Financial Statistics (IFS) of the IMF, because the ECB data set started only in 1989. The model is estimated using monthly data and the estimation period is 1980:1-2000:1.⁵ The sample covers two complete interest rate cycles. For a summary of the data and sources, see the Appendix.

Table 2 provides the correlation between (the level and the first differences of) the money market rate with the lending rate.

³This is one of the differences with the study of Mojon (2000) who employed a whole range of interest rates, which lack comparability. Furthermore, in contrast to Mojon (2000), we focus on changes in pass-through over time.

⁴We have also used the T-bill rate for Italy, because according to Cottarelli et al. (1995, p. 693), lending on the Italian interbank market was limited before the 1990s, and the T-bill rate was the relevant reference rate then. The results are similar.

⁵For the lending rate the periods are 1983:8-1999:11 for Italy and 1984:4-2000:1 for France.

Money market rate versus lending rate	Correlations	
	Levels	First differences
Belgium	0.97	0.82
Germany	0.83	0.50
Spain	0.99	0.85
France	0.93	0.08
Italy	0.97	0.38
Netherlands	0.99	0.70

Table 2: Correlations between money market and lending rates.

As pointed out in the introduction, the purpose of this paper is to examine whether or not the pass through from policy to bank lending rates has become more similar over time in countries in the euro area, i.e. whether there is convergence in monetary transmission. It is sometimes claimed that convergence has occurred (or will occur). For instance, Suardi (2001, p. 19) argues that "in the euro area one may expect a convergence towards a fuller and more homogenous pass through from policy to bank lending rates. This is because all countries share a same - on average less volatile - money market rate, and it has been shown that the pass through from policy to bank lending rates is inversely related to the volatility of the money market rate."

As shown in section 2, previous empirical research has not explicitly examined whether or not convergence over time has occurred, but focused on the pass through for a certain estimation period. This led to the conclusion that substantial differences exist across euro-zone countries. As our sample period differs from those of previous studies on pass through in the euro area, we start with the widely used model of Cottarelli and Kourelis (1994). The estimated model is

$$i_t = \beta_0 + \beta_1 i_{t-1} + \beta_2 m_t + \dots + \beta_{n+2} m_{t-n} + u_t \quad (1)$$

where i_t denotes the lending rate in month t ; m_t is the money market rate and u_t is an error term.⁶ On the basis of the model (1), the following multipliers can be calculated:⁷

- The impact multiplier: $h_0 = \beta_2$.

⁶As noted by Cottarelli and Kourelis (1994), this specification and the resulting steady state solution is consistent with a monopolistic competition model relating the loan rate to the money market rate (i.e. to the exogenously given marginal costs of funds).

⁷See Stewart and Venieris (1978) for details.

- The long-term multiplier: $h_l = \frac{1}{1-\beta_1} \sum_{i=0}^n \beta_{2+i}$.

As previous studies focusing on different sample periods came up with often diverging parameter estimates, this suggests that the relationship between money market and lending rates may not be stable over time. Therefore, we first test for parameter instability in the long-run relationship between money market and lending rates following Hansen (1992). In this, we use the Fully Modified (FM-) OLS estimator of Phillips and Hansen (1990) to take the cointegration relationship into account. The underlying idea of cointegration is that non-stationary time series (such as interest rates) can move apart in the short run, but will be brought back to an equilibrium relation in the long run. As the parameter instability tests suggest that the relationship between the money market and the lending rates is not stable in all countries in our sample, we examine this relationship in more detail using rolling regression techniques in an error correction framework. A general formulation of the Error Correction Model (ECM) is⁸

$$\Delta i_t = c + \sum_{j=1}^{j \max} \alpha_j \Delta i_{t-j} + \sum_{k=0}^{k \max} \beta_k \Delta m_{t-k} + \lambda e_t + u_t$$

or alternatively

$$\Delta i_t = \tilde{c} + \sum_{j=1}^{j \max} \alpha_j \Delta i_{t-j} + \sum_{k=0}^{k \max} \beta_k \Delta m_{t-k} + \lambda (i_{t-1} - \hat{\delta} m_{t-1}) + u_t, \quad (2)$$

where e_t denotes the residuals of the long-run (cointegration) equation; $\hat{\delta}$ is the estimated long-run parameter. For our main purpose - i.e. to examine whether convergence has occurred - we will first test for cointegration and then estimate this model and apply rolling regressions. The idea behind this approach is to take a fixed number of observations and to redo the regressions, every time adding one observation at the end of the sample, while dropping one at the beginning. The results should indicate whether the monetary policy transmission has been stable over time in the country under consideration. By comparing the development of the various parameters across the countries in our sample, we can answer our question whether convergence has occurred or not. We focus on the following parameters:

- β_0 , which is comparable to the impact multipliers in Cottarelli and Kourelis (1994);

⁸See also Kleimeier and Sander (2000), Mojon (2000) and Sander and Kleimeier (2001).

	Lags	h_0		h_l	
Belgium	12	0.752	(0.033)	1.018	(0.085)
Germany	8	0.330	(0.029)	0.899	(0.056)
Spain	8	0.898	(0.031)	1.135	(0.054)
France	10	0.075	(0.053)	0.618	(0.132)
Italy	2	0.175	(0.036)	0.616	(0.061)
Netherlands	5	0.847	(0.048)	0.965	(0.056)

Table 3: Results for the Cottarelli and Kourelis (1994) model for the full sample period (standard errors in parenthesis).

- $\hat{\delta}$: indicates the long-run equilibrium relationship between both interest rates, which is comparable to the long-run multipliers in Cottarelli and Kourelis (1994);
- λ : shows the adjustment speed.

The following section presents our results.

4 Estimation results

As explained in the previous section, we start our empirical analysis with the model of Cottarelli and Kourelis (1994). This is mainly done to check whether our sample period leads to different results than those of previous studies. As ADF tests clearly indicate that we cannot reject the hypothesis that the interest rates are $I(1)$, the model is estimated in first differences.⁹ The second step is the selection of the number of lags to be included. We have used Akaike’s Information Criterion (AIC) to determine the lag structure. Table 3 presents the multipliers for the lending rate. It clearly follows that there are substantial differences across countries with respect to both the initial effect of monetary policy and the long-term effect of policy-induced interest rate changes. This finding is in line with the conclusions of previous studies.

As explained in the previous section, next we test for parameter stability using the method suggested by Hansen (1992). These tests are superior to more traditional tests for a break (like the Chow-test), as they test for various sorts of parameter instability. For this purpose we first had to estimate

⁹We have also used other unit root tests, which led to the same conclusion.

	SupF		MeanF		Lc	
Belgium	21.82	***	9.97	***	0.97	***
Germany	15.37	**	10.52	***	1.72	***
Spain	14.07	**	3.89	*	0.34	
France	13.19	**	3.51		0.23	
Italy	28.63	***	9.98	***	1.20	***
Netherlands	8.41		5.05	**	0.92	***

Table 4: Parameter stability tests of Hansen (1992). Note: ***, **, and * denote significance levels of 1, 5, and 10 %, respectively.

the following model, using the fully modified OLS method of Philips and Hansen (1990):

$$i_t = \varphi_0 + \varphi_1 m_t + u_t.$$

The tests are joint tests on φ_0 and φ_1 . All tests have a common nullhypothesis, i.e. that the parameters are stable over time, but have various alternative hypotheses. The tests are:

- SupF test of Quandt (1960), testing for a single structural break of unknown timing;
- MeanF test, testing whether coefficients are a random walk;
- Lc test, testing whether the coefficients are a random walk with parameter variation being relatively constant throughout the sample.

The results are shown in Table 4.

It clearly follows from Table 4 that the hypothesis of parameter stability has to be rejected for all countries. At first sight there seem to be some differences across countries. In Belgium, Germany and Italy the parameters are not stable as all test statistics are significantly different from zero. In Spain and France the tests suggest the presence of a single structural break, while for The Netherlands the parameters seem to follow a random walk. However, as noted by Hansen (1992), rejection of the null of constant parameters does not imply the particular alternative the test was designed to detect. The only statically justified conclusion is that the standard model of cointegration, including its implicit assumption of long-run stability of the cointegrating relationship, is rejected by the data.

	Lags (i, m)	β_0	$\hat{\delta}$	λ
Belgium	2,2	0.723 (0.032)	0.905 (0.010)	-0.080 (0.028)
Germany	6,4	0.309 (0.028)	0.710 (0.022)	-0.001 (0.012)
Spain	3,2	0.864 (0.030)	1.018 (0.007)	-0.281 (0.053)
France	4,6	0.085 (0.053)	0.895 (0.028)	-0.060 (0.026)
Italy	2,3	0.189 (0.034)	1.008 (0.019)	-0.103 (0.023)
Netherlands	4,6	0.879 (0.048)	1.027 (0.008)	-0.248 (0.067)

Table 5: Results for the ECM for the full sample period (standard errors in parenthesis).

Informative as these tests may be, they are joint tests on φ_0 and φ_1 . In other words, the parameter φ_0 may be unstable. From our perspective, the relevant parameter is φ_1 . The next step is therefore to estimate our preferred ECM. As pointed out, we first have to test whether the interest rates are cointegrated. It turns out that for the full sample period the variables are often not cointegrated. This is in line with the outcome for the Lc-test, which is a test of the null of cointegration against the alternative of no cointegration (Hansen, 1992). However, in the subsamples as used in the rolling regressions the variables are clearly cointegrated (full details available in Toolsema et al., 2001). Consequently, we could employ the ECM as described by (2). Like in the previous section, the optimal lag structure (for Δm_t and Δi_t) is determined using AIC for the full estimation period and applying a maximum number of lags of six for both variables.

Table 5 shows the results for the full sample period. As before, there is clear evidence that the pass through differs substantially across the countries in the euro area.

The rolling regressions of the ECM have been done with 84 and 60 months. We only report the results for the 7 year period (the results for the 5 year period are very similar and are available on request). Figures 1-3 show the results.

Figure 1 shows that for most countries the impact multiplier is quite stable in the rolling regressions. Only in The Netherlands the impact multiplier decreases over time and moves towards the level of the impact multiplier in France, Germany and Italy. The multipliers in Belgium and Spain remain consistently above the multipliers in the other countries.

It follows from Figure 2 that the long-term equilibrium multipliers in all

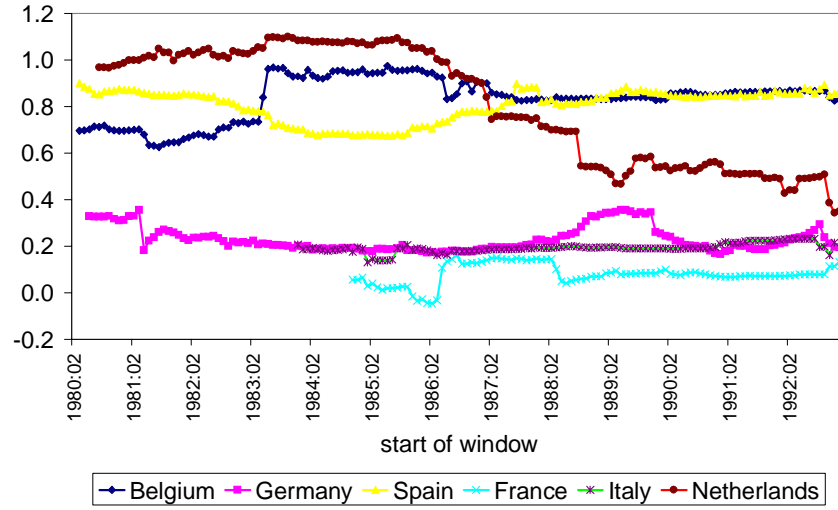


Figure 1: Impact multipliers (β_0) of the ECM model: rolling regressions.

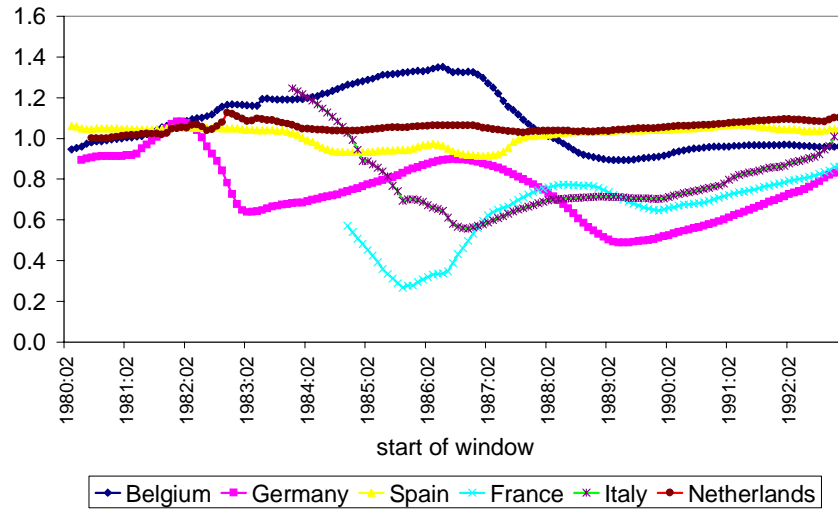


Figure 2: Long-term equilibrium multipliers ($\hat{\delta}$) of the ECM model: rolling regressions.

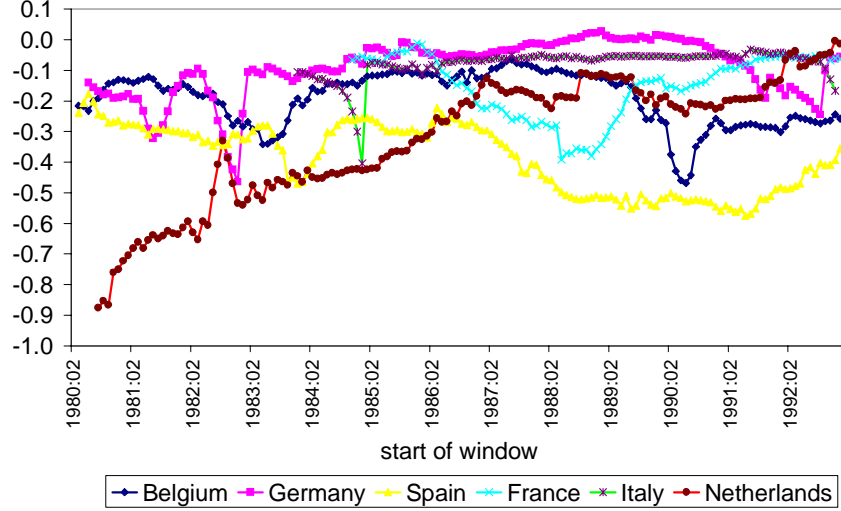


Figure 3: Adjustment speed (λ) in the ECM model: rolling regressions.

countries moved towards similar levels. In other words, this evidence suggests that there is convergence of long-term multipliers. This process is visible in windows which start at the end of the 1980s. Still, it also follows that this convergence came after a period which showed some divergence. The multipliers in France, Germany and Italy initially moved away from those in Belgium, Italy and The Netherlands that all had fairly stable multipliers. Finally, Figure 3 shows the speed of adjustment. It becomes clear that the speed of adjustment is relatively stable over time in most countries, except for The Netherlands, which initially had a very diverging speed of adjustment. Although the speed of adjustment in the various countries has become more similar over time, there remains quite some variation.

Including confidence intervals into the above figures makes them undecipherable. As an illustration, we therefore present in Table 6 the estimation results including standard errors for three of the windows used in the rolling regressions the subsamples, i.e. 1985:1-1991:12; 1989:1-1995:12; and 1993:1-1999:12.

	β_0			$\hat{\delta}$			λ		
	1985- 1991	1989- 1995	1993- 1999	1985- 1991	1989- 1995	1993- 1999	1985- 1991	1989- 1995	1993- 1999
Belgium	0.94 (0.08)	0.83 (0.05)	0.83 (0.05)	1.28 (0.04)	0.90 (0.03)	0.96 (0.01)	-0.12 (0.06)	-0.12 (0.05)	-0.28 (0.10)
Germany	0.18 (0.05)	0.34 (0.07)	0.20 (0.05)	0.76 (0.02)	0.52 (0.06)	0.84 (0.02)	-0.03 (0.06)	-0.01 (0.03)	-0.05 (0.05)
Spain	0.68 (0.04)	0.84 (0.07)	0.88 (0.07)	0.93 (0.03)	1.03 (0.02)	1.05 (0.01)	-0.25 (0.09)	-0.51 (0.11)	-0.34 (0.09)
France	0.03 (0.09)	0.08 (0.07)	0.10 (0.08)	0.48 (0.09)	0.75 (0.03)	0.85 (0.05)	-0.06 (0.04)	-0.32 (0.12)	-0.06 (0.05)
Italy	0.13 (0.03)	0.20 (0.02)	0.22 (0.03)	0.89 (0.05)	0.71 (0.04)	1.01 (0.02)	-0.08 (0.03)	-0.05 (0.030)	-0.17 (0.03)
Netherlands	1.06 (0.08)	0.52 (0.09)	0.35 (0.09)	1.04 (0.02)	1.04 (0.02)	1.10 (0.02)	-0.42 (0.13)	-0.12 (0.08)	-0.02 (0.07)

Table 6: Results for the ECM for three selected windows of the rolling regressions (standard errors in parenthesis). Note: the last window for Italy covers 1992:11-1999:10 instead of 1993:1-1999:12.

5 Concluding remarks

In this paper we have examined how the pass through of monetary policy measures in 6 EMU countries has evolved over time and whether there is convergence in monetary transmission. The countries included are: Belgium, Germany, Spain, France, Italy, and The Netherlands and the sample period is 1980-2000. One potential objection to our analysis based on rolling regressions is that it can be argued that the start of EMU implies a regime shift and that, therefore, the Lucas critique applies. However, as Issing (2001, p. 290) points out: ‘One should realize that, first, a long and gradual process of monetary convergence has preceded the introduction of the new currency, so that many of the adjustments may already have taken place. Second, the effect of the single currency on competition in goods, labor, and financial markets follows previous structural changes such as the Single Market Initiative, so that whatever structural change will take place is part of an on-going process.’ Indeed, our results lend support to Issing’s view. We conclude that although major differences in pass through exist in our sample, both for the initial and the long-run responses to policy-induced interest rate changes, there is at least some evidence for convergence of monetary

policy transmission.

A Appendix: Data and Sources

We consider the six largest EMU countries: Belgium, Germany, Spain, France, Italy, and The Netherlands and use monthly data for the period 1980:1-2000:1 where possible. For Italy, the sample period is 1983:8-1999:11 and for France it is 1984:4-2000:1.

The money market rate used refers to the three-month interbank rate. Sources: BIS for Belgium, Germany, Spain, and France; Thomson Financial Datastream for Italy; and Prebon/Yamane for The Netherlands. For the observations after the start of EMU the three-month euro interbank market rate has been used (source: DNB Financiële Markten). Data have kindly been provided by Jan Kakes of the Dutch central bank.

For Italy we used the T-bill rate from the International Financial Statistics (IFS) of the IMF as an alternative (results are not shown).

The data for the lending rate (short-term loans to enterprises) have been provided by the ECB (source: National Retail Interest Rates), except for Italy where we have used the lending rate as published in the International Financial Statistics (IFS) of the IMF, because the ECB data set started only in 1989.

References

- BARRAN, F., V. COUDERT, AND B. MOJON (1996): “The Transmission Mechanism of Monetary Policy in European Countries,” CEPII Working Paper 9603.
- BIS (1994): *National Differences in Interest Rate Transmission*. CB 394, Basle.
- BORIO, C. E. V., AND W. FRITZ (1995): “The Response of Short-Term Bank Lending Rates to Policy Rates: A Cross-Country Perspective,” in *Financial Structure and the Monetary Policy Transmission Mechanism*. BIS, Basle.
- COTTARELLI, C., G. FERRI, AND A. GENERALE (1995): “Bank Lending Rates and Financial Structure in Italy,” *IMF Staff Papers*, 42(3), 670–700.

- COTTARELLI, C., AND A. KOURELIS (1994): “Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy,” *IMF Staff Papers*, 41(4), 587–623.
- DORNBUSCH, R., C. A. FAVERO, AND F. GIAVAZZI (1998): “Immediate Challenges for the European Central Bank,” *Economic Policy*, 0(26), 15–64.
- EHRMANN, M. (2000): “Comparing Monetary Transmission Across European Countries,” *Weltwirtschaftliches Archiv*, 136(1), 58–83.
- EIJFFINGER, S. C. W., AND J. DE HAAN (2000): *European Monetary and Fiscal Policy*. Oxford University Press, Oxford.
- FRIED, J., AND P. HOWITT (1980): “Credit Rationing and Implicit Contract Theory,” *Journal of Money, Credit, and Banking*, 12(3), 471–487.
- GERLACH, S., AND F. SMETS (1995): “The Monetary Transmission Mechanism: Evidence from the G-7 Countries,” in *Financial Structure and the Monetary Policy Transmission Mechanism*, pp. 188–224. BIS, Basle.
- HANSEN, B. E. (1992): “Tests for Parameter Instability in Regressions with I(1) Processes,” *Journal of Business and Statistics*, 10(3), 321–335.
- HOFMANN, B. (2002): “The Pass-Through of Money Market Rates to Business Loan Rates in the Euro Area Countries,” mimeo, Center for European Integration Studies (ZEI), University of Bonn, Bonn.
- ISSING, O. (2001): “The Monetary Transmission Process: Concluding Remarks,” in *The Monetary Transmission Process. Recent Developments and Lessons for Europe*, ed. by Deutsche Bundesbank. Palgrave, New York.
- KLEIMEIER, S., AND H. SANDER (2000): “Regionalisation versus Globalisation in European Financial Market Integration: Evidence from Co-Integration Analyses,” *Journal of Banking and Finance*, 24(6), 1005–1043.
- KLEMPERER, P. (1987): “Markets with Consumer Switching Costs,” *Quarterly Journal of Economics*, 102(2), 375–394.
- LOWE, P., AND T. ROHLING (1992): “Loan Rate Stickiness: Theory and Evidence,” Research Discussion Paper 9206, Reserve Bank of Australia, Sydney.

- MACKINNON, J. G. (1991): "Critical Values for Cointegration Tests," in *Long-Term Economic Relationships: Readings in Cointegration*, ed. by R. F. Engle, and C. W. J. Granger, chap. 13, pp. 267–276. Oxford University Press, Oxford.
- MOAZZAMI, B. (1999): "Lending Rate Stickiness and Monetary Transmission Mechanism: The Case of Canada and the United States," *Applied Financial Economics*, 9(6), 533–538.
- MOJON, B. (2000): "Financial Structure and the Interest Rate Channel of Monetary Policy," Working Paper 40, European Central Bank, Frankfurt am Main.
- PHILLIPS, P. C. B., AND B. E. HANSEN (1990): "Statistical Inference in Instrumental Variables Regression with I(1) Processes," *Review of Economic Studies*, 57(1), 99–125.
- RAMASWAMY, R., AND T. SLOEK (1997): "The Real Effects of Monetary Policy in the European Union: What are the Differences?," IMF Working Paper WP/97/160, International Monetary Fund, Washington.
- SANDER, H., AND S. KLEIMEIER (2001): "Asymmetric Adjustment of Commercial Bank Interest Rates in the Euro Area: Implications for Monetary Policy," mimeo, University of Applied Sciences Cologne, Cologne.
- STEWART, D. B., AND Y. P. VENIERIS (1978): "Dynamic Multipliers: A Note on the Generalization to Many Lags," *Journal of Regional Science*, 18(3), 459–462.
- STIGLITZ, J. E., AND A. WEISS (1981): "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71(3), 917–926.
- SUARDI, M. (2001): "EMU and Asymmetries in the Monetary Policy Transmission," Economic Paper 157, European Commission, Brussels.
- TOOLSEMA, L. A., J.-E. STURM, AND J. DE HAAN (2001): "Convergence of Monetary Transmission in EMU: New Evidence," Working Paper 465, CESifo, Munich.